

We Claim:

1. An optical sampling method, comprising the steps of:

modulating an optical signal using at least one first electroabsorption modulator (EAM) driven using at least one sinusoidal RF voltage signal to provide
5 substantially jitter free temporal gating of the optical signal; and

routing a gated optical signal from the at least one first EAM through at least one second EAM to provide an optical output signal having a reduced repetition rate, the second EAM being driven using an electrical pulse train having a repetition rate that is a subharmonic of the frequency of the sinusoidal RF voltage
10 signal driving the first EAM.

2. The method of claim 1, further comprising converting the optical output signal from the second EAM to an electronic signal using at least one photodetector; and

15 sampling the electronic signal from the at least one photodetector with at least one analog-to-digital converter.

3. The method of claim 1, further comprising routing the optical signal through the at least one first EAM more than once.

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4. The method of claim 3, wherein routing the optical signal through the at least one first EAM more than once includes routing an output of the at least one EAM through an optical amplifier, a delay device, off a mirror device and through the at least one first EAM such that the optical signal is gated at least twice.

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5. The method of claim 1 further comprising:

detecting the gated optical output of the at least one first EAM using at least one photodetector; and

processing the output of the at least one photodetector to generate a control signal for a voltage controlled oscillator, wherein the at least one sinusoidal RF voltage signal for driving the at least one first EAM is derived from the output of the voltage controlled oscillator.

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6. An optical sampling apparatus comprising:

at least one first electroabsorption modulator (EAM) for modulating an optical signal to provide a gated optical signal;

at least one second EAM optically coupled to the at least one first EAM for
10 receiving the gated optical signal from the at least one first EAM and providing an optical output signal having a reduced repetition rate; and

drive circuitry adapted to 1) drive the first EAM with at least one sinusoidal RF voltage signal to provide substantially jitter free temporal gating of the optical signal, and 2) drive the second EAM with an electrical pulse train having a
15 repetition rate that is a subharmonic of the frequency of the sinusoidal RF voltage signal driving the first EAM.

7. The apparatus of claim 6 further comprising at least one photodetector optically coupled to the at least one second EAM for converting the optical output signal
20 from the second EAM to an electronic signal; and

at least one analog-to-digital converter coupled to the at least one photodetector for sampling the electronic signal from the at least one photodetector.

25 8. The apparatus of claim 6 further comprising at least one photodetector optically coupled to the at least one first EAM for detecting the gated optical output of the at least one first EAM; and

a processor for processing the output of the at least one photodetector to generate a control signal for a voltage controlled oscillator, wherein the at least

one sinusoidal RF voltage signal for driving the at least one first EAM is derived from the output of the voltage controlled oscillator.

9. The apparatus of claim 8, wherein two or more of the first EAM, the second
5 EAM, and the at least one photodetector are integrated into a single chip device.

10. The apparatus of claim 6 further comprising means for routing the optical signal through the at least one first EAM more than once.

10 11. The apparatus of claim 6, further comprising a semiconductor optical amplifier optically coupled between the first EAM and the second EAM to compensate for insertion losses.

12. The apparatus of claim 6, further comprising a third EAM optically coupled
15 between the first EAM and the second EAM, wherein the drive circuitry drives the first and third EAMs using the at least one sinusoidal RF voltage signal and drives the second EAM using an electrical pulse train having a repetition rate that is a subharmonic of the frequency of the sinusoidal RF voltage signals driving the first and third EAMs.

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13. An optical sampling apparatus comprising:

a means for modulating an optical signal using at least one first electroabsorption modulator (EAM) driven using at least one sinusoidal RF voltage signal to provide substantially jitter free temporal gating of the optical signal; and

25 means for routing a gated optical signal from the at least one first EAM through at least one second EAM to provide an optical output signal having a reduced repetition rate, the second EAM being driven using an electrical pulse train having a repetition rate that is a subharmonic of the frequency of the sinusoidal RF voltage signal driving the first EAM.